# Practice M4: Clustering and High Availability

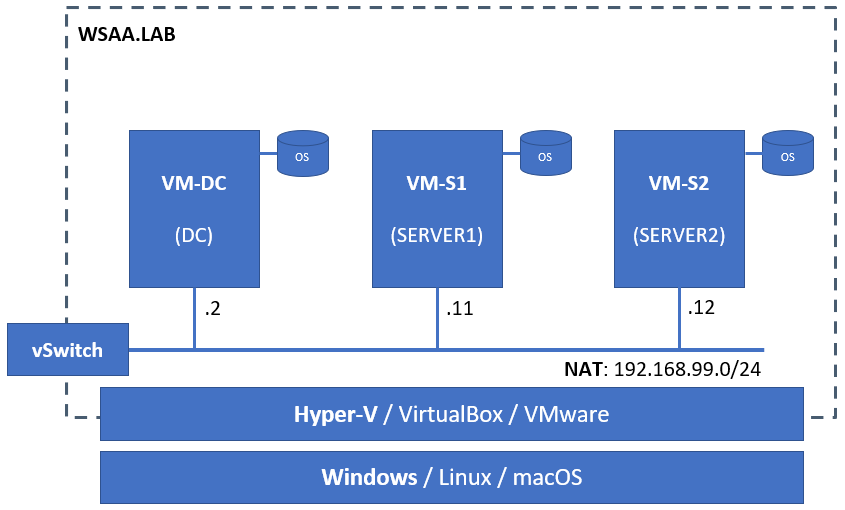
For the purpose of this lab and the course, we will consider that we are working in a pure **Windows** environment either on-premise or in the cloud, and using **Hyper-V** as a virtualization solution. All tasks can be achieved under different configuration (another host OS or virtualization solution) with the appropriate adjustments

The expected lab infrastructure (it will evolve throughout the practice) consists of up to four machines – one domain controller (**DC**), one storage server (**STORAGE**) and two member servers (**SERVER1** and **SERVER2**). Each machine will have one OS disk and 1 NIC for start. **Windows Server 2019 Standard** is enough, Desktop experience or core – it is up to you

If you are short on resources, you can shrink the infrastructure down to three machines – domain controller and two member servers. The **AD DS** and **File Server** roles can be combined on the **DC** machine. All tasks should be adjusted accordingly

## Part 1: Clustering 101 (NLB)

The overall picture should look like:



Please make sure that you have **Enable** **MAC address spoofing** selected on all adapters that will be part of the cluster. For all machines, the memory should be set at least to something between 1GB and 1,5GB of (dynamic) RAM

### Preparation

Log on to the **SERVER1** with account that has administrative privileges

Start **Server Manager** and navigate to **Local Server**

Click on the **Ethernet** adapter and then from the context menu choose **Properties**

Double-click the **Internet Protocol Version 4 (TCP/IPv4)** item

Set the **IP address** to **192.168.99.11** and the **Subnet mask** to **255.255.255.0**

Click **OK** to close the **Internet Protocol Version 4 (TCP/IPv4) Properties** window

Click **OK** to close the **Ethernet** **Properties** window

Repeat the same procedure on **SERVER2** but for **IP address** set **192.168.99.12**

### Role installation

Log on to the **SERVER1** with account that has administrative privileges

Start **Server Manager** and navigate to **Manage** and then **Add Roles and Features**

On the first screen click **Next**

Make sure that **Role-based or feature-based installation** is selected and click **Next**

Ensure that **SERVER1** is selected and click **Next**

On the **Select server roles** screen click **Next**

On the **Select features** screen select **Network Load Balancing**

On the dialog screen for the required features click **Add Features**

Click on **Next**

On the confirm installation screen click **Install**

When the installation is complete, click on **Close**

Repeat the same procedure on **SERVER2**

### Creating an NLB cluster

Log on to the **SERVER1** with account that has administrative privileges

Start **Server Manager** and navigate to **Tools** and then **Network Load Balancing Manager** tool

Select **New** from the **Cluster** menu

In the **Host** field enter the name of the server, for example **SERVER1** and click **Connect**

Select the **Ethernet** adapter in the **Interfaces available for configuring a new cluster** list and click **Next**

On the next screen accept the proposed values and click **Next**

On the **New Cluster : Cluster IP Address** click the **Add** button

Make sure that the **Add IPv4 address** is selected

Enter **192.168.99.99** for **IPv4 address** and **255.255.255.0** for **Subnet mask**

Then click **OK** to close the **Add IP Address** window

Click **Next**

Type **web.wsaa.lab** in the **Full Internet name** text field

Set the **Cluster operation mode** to **Multicast** and click **Next**

Click **Finish**

After a while, the **NLB Cluster** will be created

While still in the **Network Load Balancing Manager** tool select the **web.wsaa.lab** position

From the context menu select **Add Host To Cluster**

Enter **SERVER2** in the **Host** text field and click **Connect**

When interfaces are displayed, click on the **Ethernet** interface, and click **Next**

On the next screen click **Next**

And finally, click **Finish**

After a while you will notice that both hosts are added and converged

### Install and prepare IIS

While still on **SERVER1**, start **Server Manager** and navigate to **Manage** and then **Add Roles and Features**

On the first screen click **Next**

Make sure that **Role-based or feature-based installation** is selected and click **Next**

Ensure that **SERVER1** is selected and click **Next**

On the **Select server roles** screen select **Web Server (IIS)**

On the dialog screen for the required features click **Add Features**

Click **Next**

On the **Select features** screen click **Next**

Read the introduction to the role being installed and click **Next**

On the **Select role services** screen accept the default values and click **Next**

On the confirm installation screen click **Install**

When the installation is complete, click on **Close**

Create **index.html** file in the **C:\inetpub\wwwroot** folder with the following content:

**<h1>Hello world! (SERVER1)</h1>**

Now, open a browser and navigate to [**http://localhost**](http://localhost)

Repeat the same procedure on **SERVER2** but adjust the content of the **index.html** file

### Configuring DNS

Log on to **DC**, start **Server Manager** and navigate to **Tools** and then **DNS**

Select the **WSAA.LAB** item in the **Forward Lookup Zones** in the tree

Right-click the selected item and select **New Host (A or AAAA)**

Enter **web** in the **Name** text field and **192.168.99.99** in the **IP address** field

Select the **Create associated pointer (PTR) record** and click **Add Host** (skip it if you do not have a reverse lookup zone)

Click **OK** and then click **Done**

In the context menu of **WSAA.LAB** select the **New Alias (CNAME)** option

Enter **www** in the **Alias name** text box and **web.wsaaa.lab** in the **Fully qualified domain name (FQDN) for target host**

Click **OK**

While on the **DC** test with either **web.wsaa.lab** or [**www.wsaa.lab**](http://www.wsaa.lab)

No matter how many times you refresh, it will show the page coming from one of the servers

### Configuring cluster properties

Return to **SERVER1** and open the **Network Load Balancing Manager**

Select the cluster and from the context menu choose **Cluster Properties**

Switch to **Port Rules** tab

Select the existing rule and click **Remove**

Click **Add** to create a new rule

Set both the **From** and **To** in the **Port range** to **80**

Select **TCP** under **Protocols** section

Change the **Affinity** to **None**

Click **OK** to close the **Add/Edit Port Rule** window

Click **OK** to close the cluster properties window

Wait a file for the hosts to become converged

Log on to **DC** and test with either **web.wsaa.lab** or [**www.wsaa.lab**](http://www.wsaa.lab)

Now, it must randomly show that the page is served by different hosts

### Managing cluster hosts

Log on to **SERVER1** and open the **Network Load Balancing Manager**

Select the cluster and from the context menu choose **Control Hosts** and then **Drainstop**

Confirm that you want to stop traffic to the entire cluster with **OK**

Now, if you go on the **DC** and try to refresh the web page, it will return an error

Back on **SERVER1**, select one of the cluster hosts and from the context menu select **Control Hosts** and then **Start**

You may need to press the **F5** key to track the progress of the operation

Now, if you do on the **DC** and try to refresh the web page, it will be served by the active host only

Return to **SERVER1** and start the other host as well

Wait for both hosts to converge. You may need to press the **F5** key to track the progress of the operation

Now, if you go on the **DC** and try to refresh the web page, it will be served by both hosts

### Removing an NLB cluster

*Please note, that because of the cluster operation mode the following operations may seem to fail. Instead of using either SERVER1 or SERVER2 for the cluster removal, install the RSAT tool for NLB on the DC and use it to remove the cluster*

Log on to **SERVER1** and open the **Network Load Balancing Manager**

Right-click **web.wsaa.lab** and choose **Delete Cluster**

Click **Yes** to remove the cluster

You may need to press the **F5** key to track the progress of the operation

Close the **Network Load Balancing Manager**

Using **Server Manager** click **Manage** and then **Remove Roles and Features**

Click **Next** on the first screen

Ensure that **SERVER1** is selected and click **Next**

On **Remove server roles** screen click **Next**

On the **Remove feature** screen deselect the **Network Load Balancing**

When the dialog box appears, click on **Remove Features**

Click **Next**

Click **Remove** on the summary screen. Before this, you can tick the **Restart the destination server automatically if required**. If you don’t then you must restart the server manually

Click **Close** once the removal process is complete

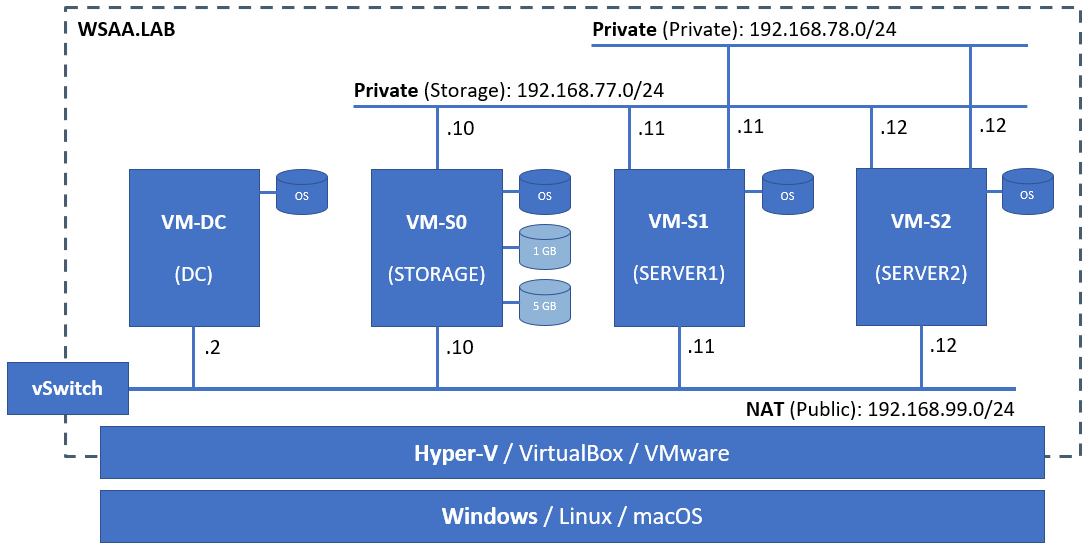
Reboot **SERVER1** if needed (if you did not select to be restarted automatically)

Repeat the same procedure on **SERVER2**

Please note, that the DNS records must be deleted manually

## Part 2: Clustering 102 (Failover Cluster)

The overall picture should look like:



Please make sure that you have **Enable** **MAC address spoofing** selected on all adapters that will be part of the cluster. For all machines, the memory should be set at least to something between 1GB and 1,5GB of (dynamic) RAM

### Preparation

We must prepare two additional private switches named for example **vPrivate** and **vStorage**

Then, we must add a few additional network adapters to **STORAGE**, **SERVER1**, and **SERVER2**

**Add-VMNetworkAdapter -VMName WSAA-M4-VM-S0 -Name "Storage NIC" -SwitchName vStorage**

**Add-VMNetworkAdapter -VMName WSAA-M4-VM-S1 -Name "Storage NIC" -SwitchName vStorage**

**Add-VMNetworkAdapter -VMName WSAA-M4-VM-S2 -Name "Storage NIC" -SwitchName vStorage**

**Add-VMNetworkAdapter -VMName WSAA-M4-VM-S1 -Name "Private NIC" -SwitchName vPrivate**

**Add-VMNetworkAdapter -VMName WSAA-M4-VM-S2 -Name "Private NIC" -SwitchName vPrivate**

Then adjust the IP addresses of the new network adapters. Do not add default gateway and DNS settings

#### Software installation

Log on to the **STORAGE** server with account that has administrative privileges

Start **Server Manager** and go to **Manage** and click on **Add Roles and Features**

On the first screen click **Next**

Make sure that **Role-based or feature-based installation** is selected and click **Next**

Ensure that **STORAGE** is selected and click **Next**

Expand the **File and Storage Services** node

Select the **iSCSI Target Server** option and click **Next**

When asked to install additional features, click **Add Features**

On the features screen click on **Next**

Start the installation by clicking on **Install**

When the installation is complete, click on **Close**

#### Quorum disk and target creation

Return to **Server Manager** and click on **File and Storage Services** in the left pane

Select **iSCSI** option

Click on **New iSCSI Virtual Disk** option under **Tasks** menu

On the first screen click **Next**

Enter **Disk1** in the **Name** field and **Quorum Disk** in the **Description** field then click **Next**

For **Size** set **1 GB** and make sure that the **Dynamically expanding** option is selected then click **Next**

Make sure that the **New iSCSI Target** option is selected and click **Next**

Enter **quorum-target** in the **Name** field and click **Next**

On the **Specify access servers** screen click on **Add**

Select the **Enter a value for the selected type**

In the **Type** drop-down list select **IP Address** and enter **192.168.77.11** in the **Value** field and click **OK**

Click **Add** again to add the second node

Select the **Enter a value for the selected type**

In the **Type** drop-down list select **IP Address** and enter **192.168.77.12** in the **Value** field and click **OK**

Click **Next**

Leave the default security settings as they are and click **Next**

Check the information on the summary screen and click **Create**

Once the process is complete, click **Close**

#### Shared disk and target creation

Return to **Server Manager** and click on **File and Storage Services** in the left pane

Select **iSCSI** option

Click on **New iSCSI Virtual Disk** option under **Tasks** menu

On the first screen click **Next**

Enter **Disk2** in the **Name** field and **Shared Disk** in the **Description** field then click **Next**

For **Size** set **5 GB** and make sure that the **Dynamically expanding** option is selected then click **Next**

Make sure that the **New iSCSI Target** option is selected and click **Next**

Enter **shared-target** in the **Name** field and click **Next**

On the **Specify access servers** screen click on **Add**

Select the **Enter a value for the selected type**

In the **Type** drop-down list select **IP Address** and enter **192.168.77.11** in the **Value** field and click **OK**

Click **Add** again to add the second node

Select the **Enter a value for the selected type**

In the **Type** drop-down list select **IP Address** and enter **192.168.77.12** in the **Value** field and click **OK**

Click **Next**

Leave the default security settings as they are and click **Next**

Check the information on the summary screen and click **Create**

Once the process is complete, click **Close**

#### Configure iSCSI initiator on node 1

Log on to **SERVER1** which will play client role in our case

Open **Server Manager** and click on **iSCSI Initiator** under **Tools**

Click **Yes** to confirm that you want to start the service

Switch to **Discovery** tab

Click on the **Discover Portal** button

In the **IP address or DNS name** field enter the IP address of our target server **STORAGE – 192.168.77.10**

Click on **Advanced** button

Change **Local adapter** to **Microsoft iSCSI Initiator**

Select **192.168.77.11** in the **Initiator IP** drop-down list

Click **OK** to close the **Advanced Settings** window

Click **OK** to close the **Discovery Target Portal** window

Switch back to **Targets** tab

Select one of the inactive records and click the **Connect** button

Then click on **Advanced** and select the correct adapter (**Microsoft iSCSI Initiator**), initiator IP (**192.168.77.11**) and target IP (**192.168.77.10**)

Click on **OK** to close the **Advanced Settings** window

Click **OK** to close the **Connect To Target** window

The status will change to **Connected**

Repeat the procedure for the second inactive record

Switch to **Favorite Targets** tab, we should see our targets there as well

Switch to **Volumes and Devices** tab and click on **Auto Configure**

Click **OK** to close the tool

Open **Disk Management** console

Select **Disk 1,** bring it **online** and then **initialize** it with **GPT**

Create **New Simple Volume** that consumes the whole disk space, assign a drive letter (for example Q), format it with **NTFS** and set the label to **QuorumDisk**

Select **Disk 2,** bring it **online** and then **initialize** it with **GPT**

Create **New Simple Volume** that consumes the whole disk space, assign a drive letter (for example S), format it with **NTFS** and set the label to **SharedDisk**

#### Configure iSCSI initiator on node 2

Log on to **SERVER2** which will play client role in our case

Open **Server Manager** and click on **iSCSI Initiator** under **Tools**

Click **Yes** to confirm that you want to start the service

Switch to **Discovery** tab

Click on the **Discover Portal** button

In the **IP address or DNS name** field enter the IP address of our target server **STORAGE – 192.168.77.10**

Click on **Advanced** button

Change **Local adapter** to **Microsoft iSCSI Initiator**

Select **192.168.77.12** in the **Initiator IP** drop-down list

Click **OK** to close the **Advanced Settings** window

Click **OK** to close the **Discovery Target Portal** window

Switch back to **Targets** tab

Select one of the inactive records and click the **Connect** button

Then click on **Advanced** and select the correct adapter (**Microsoft iSCSI Initiator**), initiator IP (**192.168.77.12**) and target IP (**192.168.77.10**)

Click on **OK** to close the **Advanced Settings** window

Click **OK** to close the **Connect To Target** window

The status will change to **Connected**

Repeat the procedure for the second inactive record

Switch to **Favorite Targets** tab, we should see our targets there as well

Switch to **Volumes and Devices** tab and click on **Auto Configure**

Click **OK** to close the tool

Open **Disk Management** console. Both disks will appear as offline. It is the way it should be. Leave it as is

### Installing failover clustering

Log on to the **SERVER1** server with account that has administrative privileges

Start **Server Manager** and go to **Manage** and click on **Add Roles and Features**

On the first screen click **Next**

Make sure that **Role-based or feature-based installation** is selected and click **Next**

Ensure that **SERVER1** is selected and click **Next**

On the roles page click **Next**

On the features screen select **Failover Clustering**

When asked to install additional features, click **Add Features**

Click on **Next**

Start the installation by clicking on **Install**

Before this, you can tick the **Restart the destination server automatically if required**. If you don’t then you must restart the server manually

When the installation is complete, click on **Close**

Reboot **SERVER1** (if not set to reboot automatically after installation)

Repeat the same procedure on **SERVER2** as well

### Creating a failover cluster

Log on to **SERVER1** and pen **Server Manager**

Click on **Failover Cluster Manager** under **Tools**

Tick the **Don’t show this message again** and close the dialog box

Click **Validate Configuration** under **Actions**

On the welcome screen click **Next**

Type **SERVER1;SERVER2** in the **Enter name** field and click **Add**

Click **Next**

On **Testing Options** screen make sure that the **Run all tests (recommended)** is selected and click **Next**

On the **Confirmation** screen click **Next**

After a while, a summary screen will appear. Make sure that everything is with status **Success**

In our case we can continue with some minor warnings but in production **we should not**. **In order our cluster to be supported the validation should pass without errors or warnings**

Select the **Create the cluster now using the validated nodes** and click **Finish**

New **Create Cluster Wizard** will appear

Click **Next** on the welcome screen

Enter **Cluster1** in the **Cluster Name** field

Then click on the **Address** field and enter **192.168.99.33**

Click **Next**

Examine the information on the **Confirmation** screen and click **Next**

Once the process is complete, you can click on **View Report** to check details about the process. Click **Finish**

While in **Failover Cluster Manager**, click on and expand the **Cluster1.WSAA.LAB** node

Explore the information provided by the other nodes

### Configure (check) the quorum

Log on to **SERVER1** and start **Failover Cluster Manager** console

Navigate to **Disks** node under **Storage**

Explore the available disks

Click on **Cluster1.WSAA.LAB** and from the context menu select **Configure Cluster Quorum Settings** under **More Actions**

Click **Next** on the welcome screen

Select **Advanced quorum configuration** and click **Next**

Make sure that **All Nodes** option is selected and click **Next**

Then, make sure that the **Configure a disk witness** option is selected and click **Next**

On the next screen the smaller disk (1 GB) should be selected already. Leave it as it is and click **Next**

Click **Next**

Once the process is complete, you can click on **View Report** to check details about the process. Click **Finish**

### Deploy a general use file server role

Log on to **SERVER1** and pen **Server Manager**

Click on **Failover Cluster Manager** under **Tools**

Click **Configure Role** under **Actions**

On the welcome screen click **Next**

Next, on the **Select Role** screen, select **File Server**

A message indicating that the role is not installed will appear under the list of roles

Use the **Server Manager** or **PowerShell** to install the missing role (**File Server**) on both nodes and return here

If the wizard doesn’t recognize that the role is installed, close it and open it again

Once you move past the role selection screen, make sure that the **File Server for general use** is selected. Click **Next**

Type **FileServer** in the **Name** field and enter **192.168.99.34** in the **Address** field. Click **Next**

On the next screen make sure that the **Cluster Disk 2** (the name may vary but it should be the bigger disk) is selected and click **Next**

Examine the information on the **Confirmation** screen and click **Next**

Once the process is complete, you can click on **View Report** to check details about the process. Click **Finish**

Click on **Roles** in the **Failover Cluster Manager** console to check if our new role is there

Select the **Cluster1.WSAA.LAB** node and check which node is marked as **Current Host Server**. If this is the **SERVER2** then from the context menu select **More Actions > Move Core Cluster Resources > Select Node** to move the cluster resources. On the dialog window select **SERVER1** and click **OK**

Select the **Roles** node again and check which node is marked as **Owner Node**. If this is **SERVER2** then while the **File Server** role is selected, in **Actions** section click on **Move** and then on **Select Node** to change the owner. In the dialog that will open, select **SERVER1** and click **OK**

Make sure that you are in **Roles** section and have the **File Server** role selected

Select **Add File Share** in the **Actions** section and **New Share Wizard** will open

Select the **SMB Share – Quick** option and click **Next**

On the **Share Location** window make sure that the **FileServer** cluster role is selected

Then select the **Type a custom** path, enter **e:\share** (adjust it to be on the bigger disk) in the text box and click **Next**

Examine the information on the **Share Name** screen, leave all as it is and click **Next**

A warning that the local path does not exist. Click **OK** to create it

Accept or adjust the settings on the **Other Settings** window. For example, select **Enable access-based enumeration** and click **Next**

Adjust the proposed on the **Permissions** screen if needed and click **Next**

Examine the information on the **Confirmation** screen and click **Create**

Once the process is complete, click **Close**

While the **File Server** role is still selected, explore the information on both tabs **Resources** and **Shares**

We may go one of the other servers and try to access the share ([\\FileServer\Share](file:///\\FileServer\Share))

We may try to create a file and switch the role to the other node

### Deploy a scale-out file server

We can add new resources or free resources used by the role that we have. First, we have to remove it

Being on **SERVER1** with **Failover Cluster Manager** console open, select the **Roles** node

Click on **Remove** in the **Actions** panel and confirm the removal with **Yes**

Navigate to **Disks** under **Storage** in the tree panel on the left

Select **Cluster Disk 2** (the name may vary but is should be the bigger disk) and click **Add to Cluster Shared Volumes** option under **Actions** panel

Check drive **C:** on both servers, you should see a folder named **ClusterStorage**

Return to the **Roles** node and click on **Configure Role** option under **Actions** panel

On the welcome screen click **Next**

Next, on the **Select Role** screen, select **File Server** and click **Next**

Select **Scale-Out File Server for application data** and click **Next**

Enter **FileServer** in the **Name** text box and click **Next**

On the **Confirmation** window click **Next**

Once the process is complete, you can click on **View Report** to check details about the process. Click **Finish**

Select the **Roles** node again and check which node is marked as **Owner Node**. If this is **SERVER2** then while the **File Server** role is selected, in **Actions** section click on **Move** and then on **Select Node** to change the owner. In the dialog that will open, select **SERVER1** and click **OK**

Make sure that you are in **Roles** section and have the **File Server** role selected

Select **Add File Share** in the **Actions** section

**New Share Wizard** will open

Select the **SMB Share – Quick** option and click **Next**

On the **Share Location** window make sure that the **FileServer** cluster role is selected

Notice that **Share location** is set to **Select by volume** and there is a volume **C:\ClusterStorage\Volume1**

Click **Next**

Enter **Data** in the **Share name** text field on the **Share Name** screen. Click **Next**

Accept or adjust the settings on the **Other Settings** window. For example, select **Enable access-based enumeration** and click **Next**

Adjust the proposed on the **Permissions** screen if needed and click **Next**

Examine the information on the **Confirmation** screen and click **Create**

Once the process is complete, click **Close**

While the **FileServer** role is still selected, explore the information on both tabs **Resources** and **Shares**

We may go one of the other servers and try to access the share ([\\FileServer\Data](file:///\\FileServer\Data))

We may try to create a file and switch the role to the other node

### Configure failover and preference settings

Being on **SERVER1** with **Failover Cluster Manager** console open, select the **Roles** node

Right-click on the **FileServer** role and select **Properties** from the context menu or the **Actions** menu

You can make **SERVER1** the preferred owner. To do it, you must tick the box in front of it. Do it

Switch to the **Failover** tab. Here you can set the **Failover** and **Failback** parameters

Leave all as it is and click **OK**

### Managing cluster and cluster nodes

Ensure that the core cluster resources, and the **FileServer** role are moved to **SERVER2**. This can be done by executing **More Actions > Move Core Cluster Resources** on the cluster and by executing **Move** on the role

Now, that everything is served by **SERVER2** go and restart it

Return and watch how the cluster responds

Wait until **SERVER2** is ready. Now, let’s prepare to gracefully shutdown the **SERVER1**. Select it under **Nodes** and click on **Pause > Drain Roles**

You can see that now **SERVER2** is the owner both cluster and the role

We can bring **SERVER1** back in the game by navigating to the nodes, selecting it and click **Resume** and either **Fail Roles Back** or **Do Not Fail Roles Back**

Should we want to bring the whole cluster down, we can select it and click **More Actions > Shut Down Cluster**

### Destroy a cluster

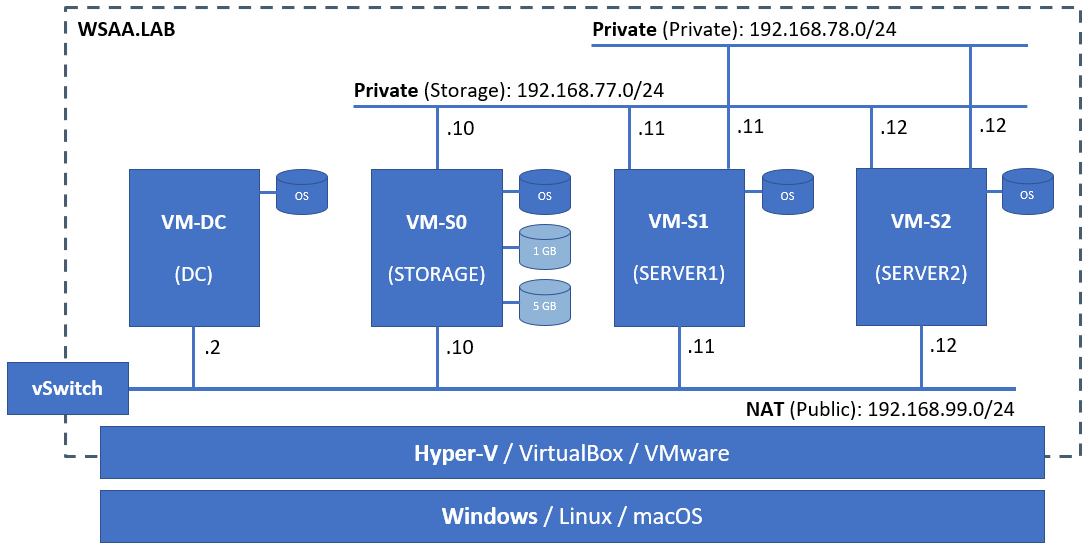
*Do not destroy it now, as we will need it later*

In order to destroy a cluster, we can remove the role first by selecting it and choosing **Remove** from the **Actions** menu

Then, we can select the cluster and choose **More Actions > Destroy Cluster** from the **Actions** menu

## Part 3: Clustering 103 (HA Virtual Machines)

The overall picture should look like (in fact we are either continuing from where we left off in the previous part or we must create new environment):



Please make sure that you have **Enable** **MAC address spoofing** selected on all adapters that will be part of the cluster. **DC** and **STORAGE** should have between **1 GB** and **1,5 GB** of dynamic RAM while **SERVER1** and **SERVER2** must have at least **2 GB**

### Preparation

Be sure that there is failover cluster set up. If not, because you are starting clean, then create one (including a disk set to **Cluster Shared Volume**)

Just make sure that there are not any roles on that cluster

Make sure that both member servers are prepared for nested virtualization:

* Dynamic memory is disabled, and memory size is setup to **2 GB** or more
* Virtualization extensions are exposed to both virtual machines
* MAC address spoofing is enabled for network adapters of both virtual machines

Using the **Server Manager** or **PowerShell** install the **Hyper-V** role on both member servers – **SERVER1** and **SERVER2**

Remember to set the default stores for example to **C:\HV**. It can be done later as well

### Highly available new VM

#### Preparation

Copy the **ALP-WEB.vhdx** disk to **SERVER1** (you can download it from <https://zahariev.pro/go/wsaa-templates>)

You can place it under the **C:\ClusterStorage\Volume1** folder and name it **VM1.vhdx**

#### Set up the VM

Being on **SERVER1** with **Failover Cluster Manager** console open, select the **Roles** node

In the **Actions** panel, click on **Virtual Machines** and then on **New Virtual Machine**

Select one of the nodes to host the new VM, for example **SERVER1** and click **OK**

A **New Virtual Machine Wizard** will appear. Click **Next**

Enter **VM1** in the **Name** text box

Select the **Store the virtual machine in a different location** option and click the **Browse** button

Navigate to **Volume1** on **ClusterStorage** (**C:\ClusterStorage\Volume1\**) and click **Select Folder**

Click **Next**

Select **Generation 1** and click **Next**

Set the **Startup memory** to **256 MB** and click **Next**

Leave it as not connected and click **Next**

Select **Use an existing virtual hard disk**

Navigate to the place where you copied the VHDX file

Once done, click **Next**

Examine the information on the summary screen and click **Finish**

After a while, the VM is created. Once done, a **High Availability Wizard** starts and configures the VM for HA

Click **Finish**

The new virtual machine will appear as a cluster role in off state

#### Live Migration

Select the VM and power it on

Wait for it to boot

Click on **Move > Live Migration > Best Possible Node** to move the VM to the other node

After a while, the VM will be moved to the other node. This can be easily seen from **Roles** section

#### VM HA

Navigate to the **Nodes** section

Select the node on which the VM is currently running

Click **Pause > Drain Roles** option under **Actions** and navigate to **Roles** to see what is going on with the VM

Navigate again to the **Nodes** section, select the paused one and click on **Resume > Fail Roles Back**

Return to **Roles** again to watch how the VM is going back where it was earlier

Select it and click **Remove** under **Actions** to remove the role. On the dialog box confirm with **Yes**

Please note, this will remove the HA option for the VM but won’t stop it or delete it from the Hyper-V host where it was last running

### Highly available existing VM

#### Preparation

Copy the **ALP-WEB.vhdx** disk to **SERVER1** (you can download it from <https://zahariev.pro/go/wsaa-templates>)

You can place it under the **C:\ClusterStorage\Volume1** folder and name it **VMEX.vhdx**

Being on **SERVER1** start Hyper-V Manager to create a new virtual machine with the following parameters:

* Name: **VMEX**
* Location: **C:\ClusterStorage\Volume1**
* Generation: **1**
* Memory: **256 MB**
* Connection: **Not Connected**
* Virtual hard disk: Existing (the one copied earlier)

Start the virtual machine

#### Set up the VM for HA

Being on **SERVER1** with **Failover Cluster Manager** console open, select the **Roles** node

Select **Configure Role** in the **Actions** panel

The **High Availability Wizard** will open

Read information in the **Before You Begin** screen and click **Next**

On the **Select Role** screen, select **Virtual Machine** from the list and click **Next**

Then select the existing **VMEX** virtual machine and click **Next**

On the **Confirmation** screen, click **Next**

Click **Finish**

Do a test and move the role to another node